
Populations in the pink?

Sarah Ward has wandered a circuitous route into freshwater biology after studying for a BSc in Physics with Planetary Science, followed by a Remote Sensing MSc. She is currently funded by Geography and Environment and the EPSRC at the University of Southampton, supervised by Drs Pete Langdon & Seth Bullock, and below outlines her PhD research in some rather enviable locations.

In April 2008, I stood at the shore of Lake Bogoria in Kenya. The green hyper-saline lake lies in a semi-arid landscape and is overlooked by a towering escarpment to the East. Along the shoreline in a swathe of pink, hundreds of thousands of flamingos were honking and preening and feeding. Some were drinking and washing at the freshwater springs while a long queue snaked out into the lake, awaiting their turn. Amongst the dense carpet of birds were perfect circles of empty space marking the location of boiling hot springs below.

lakes of the Kenyan Rift Valley.

The lesser flamingos of East Africa are well known for their vast congregations and flamboyant courtship displays. They are highly specialised filter feeders that fly between the various soda lakes to feed on Cyanobacteria, usually *Arthrospira fusiformis*, which often dominates the primary production within these systems. Flocks of flamingos up to one million strong gather where blooms of Cyanobacteria occur yet, despite these large numbers, there is concern that the species may soon be considered as

abundance and how these changes may have affected the lesser flamingo population.

To find out more about past lake conditions, I returned to Kenya with a team from the University of Southampton, Queen Mary University of London and the Natural History Museum in March 2011. We took sediment cores from Lake Bogoria, Lake Elementaita, and Lake Oloidien, which is a former basin of freshwater Lake Naivasha that has been separated by low water levels for several decades and has since become saline. These cores are now being analysed to see if past changes in cyanobacteria abundance can be identified. By examining the organic matter content using different palaeoecological techniques such as pigment analysis, I hope to identify the changes that impact upon the lesser flamingo population. My results so far show interesting changes through the sediment profiles, with fluctuations in pigments associated with Cyanobacteria and green algae. I will be dating these samples over the next few months, with funding from the Quaternary Research Association, to place the patterns in context.

In addition to the palaeolimnological approach, I am using computer modelling to create a simulation model of the soda lakes with which I am able to explore changes in



Flamingo en masse ringing the shoreline of Lake Bogoria, Kenya. Photo: Peter Langdon.

My first visit to the Rift Valley lakes was deeply inspiring. The huge density of the few species that were thriving in conditions that most others would find inhospitable was astounding. The air of mystery and unpredictability surrounding the lesser flamingo was far too interesting to ignore. Our research group was directed by Dr David Harper and was part of an interdisciplinary science initiative by the University of Leicester. David was researching the lesser flamingos at Lake Bogoria, and I found the work fascinating. I wanted to find a way to study this unique environment myself, to investigate the past crashes in Cyanobacteria abundance and the decline in lesser flamingo population. It took two years, but through a combination of good luck and determination I found my way to a PhD at Southampton from where I am now researching the soda

threatened. A decline in the East African flamingo population of at least 20% has been observed in the last 50 years, and has been punctuated by mortality events where large numbers of lesser flamingos have died at some of the soda lakes. There are many hypotheses postulated in the literature for the decline, but I am most interested in finding out whether this is due to a reduction in the availability of breeding sites, and also if deaths are a natural consequence of soda lake dynamics.

Endorheic or closed-basin lakes are highly sensitive to rainfall fluctuations, and changes in lake water level have been associated with crashes in Cyanobacteria abundance which may be a result of varying salt concentration. I am researching the dynamics of soda lake ecosystems to try and understand past changes in Cyanobacteria



L to R: Phil Sanders (QMUL), Steve Brooks (NHM), and the author extruding a core from a Livingstone corer during fieldwork on Lake Bogoria, Kenya. Photo: Pete Langdon.

the flamingo population distribution over time. The model is driven by rainfall, and will initially simulate crashes in Cyanobacteria.

To gain more insight into the functioning of the soda lakes I am exploring different ways to gather data or make use of existing information in the literature. I hope to go back this year and try out some of these ideas and take more cores from the south basin of Lake Bogoria. These were probably the most interesting cores taken in March 2011 as they appeared to be varved, but sadly despite our efforts to keep them stable and frozen they had at least partially mixed through on the long journey home.

At the moment the most challenging part of my PhD is fitting in all the research I want to do in three years! My supervisors have started gently reminding me of the time constraints, but it is difficult not to pursue avenues and ideas that could lead to something interesting. One frustrating downside to studying an exotic location is that it isn't easy to pop back to Kenya to get

more samples when I run out. I am hoping that with everything I have learned since the first field visit, one more expedition will be enough to be able to complete the sampling and analyses I am interested in.

I feel lucky to be researching something that I have such a passionate interest in. My supervisors are supportive; they are interested in my project and they give me the freedom to explore different ideas. My interdisciplinary background has given me a different perspective from which to look at problems but has also meant that each time I use a specific technique from a different discipline I do have a lot to learn. The diverse network of other PhD students I have met through the Doctoral Training Centre at the University of Southampton, and the geographers in my current department, have helped to counter this lack of in-depth experience. They have been an invaluable resource and I have to thank them all for their help along the way.

Report on the Spring 2012 Meeting of the London Freshwater Group

The Spring Meeting of the LFG took place at the Linnean Society of London on 23rd March. The meeting was well attended and around 70 freshwater enthusiasts listened intently to the first speaker, none other than Norfolk's answer to Jimi Hendrix, Stephen Lambert (UEA and SJL Ecology). Steve had a clear message and this was not to ignore the key degradational role of nitrogen in lake ecosystems. His talk was mostly focused on charophytes and was greatly appreciated by all. Next to the podium, under the watchful eye of Darwin, was UCL's Emma Wiik. Emma talked on her PhD project which was to determine the ecological response of marl lakes to eutrophication (an update from the article she produced for *FBA News* No. 54 Summer 2011). The high sensitivity and vulnerability of these lakes was highlighted using a combined limnological and palaeolimnological approach. Again charophytes were central to her story which was very nicely told. Our third speaker needed no introduction and we have been trying to attract him to the LFG for years. Yes, Loughborough's wild man, John Anderson, hit the stage and amazed all with deep insights into the functioning of remote Greenland lakes, beautifully illustrated and highlighting key findings on recent environmental change in the region. One day we will lure him back again...

After tea and biscuits and much mingling, Iain Cross (Hatfield University) spoke of his PhD work at the University of Nottingham (now completed) on the Attenborough Ponds complex, Nottinghamshire. Iain wove a story of how hydrology and connectivity influence lake responses to eutrophication. Finally the LFG was privileged to have a talk from Geoff Phillips (Environment Agency) on long-term monitoring data from the Trinity Broad in Norfolk. Geoff's talk revealed the key combined influence of fish and nutrients on shallow lake restoration. The need for long-term monitoring data was, as always, brought into sharp focus. Following the usual quick-fire and informal AGM facilitated by Steve Kett, the group retired to Walkers pub for sustenance and as always, continued discussion.

The next LFG meeting will be on Friday November 16th, 2012 (start 1330) at the Natural History Museum. Please do come along. Note that 2013 is the 40th anniversary of the LFG and the occasion will be suitably marked. Watch this space for more details in the near future.

www.londonfreshwatergroup.co.uk/

Carl Sayer (LFG Secretary)



Pair of lesser flamingo in characteristic filter feeding pose at Lake Bogoria, Kenya. Photo: Melvin Grey.